Revised 5/5/2021

PYGMY SPERM WHALE (*Kogia breviceps*): Hawaii Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Pygmy sperm whales are found throughout the world in tropical and warm-temperate waters (Caldwell and Caldwell 1989). Pygmy sperm whales have been observed in nearshore waters off Oahu, Maui, Niihau, and Hawaii Island (Shallenberger 1981, Mobley *et al*. 2000, Baird 2005, Baird *et al*. 2013). Two sightings were made during a 2002, and three during 2017 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Figure 1; Barlow 2006, Yano *et al*. 2018). A freshly dead pygmy sperm whale was picked up approximately 100 nmi north of French Frigate Shoals on a similar 2010 survey (NMFS, unpublished data). Nothing is known about stock structure for this species.

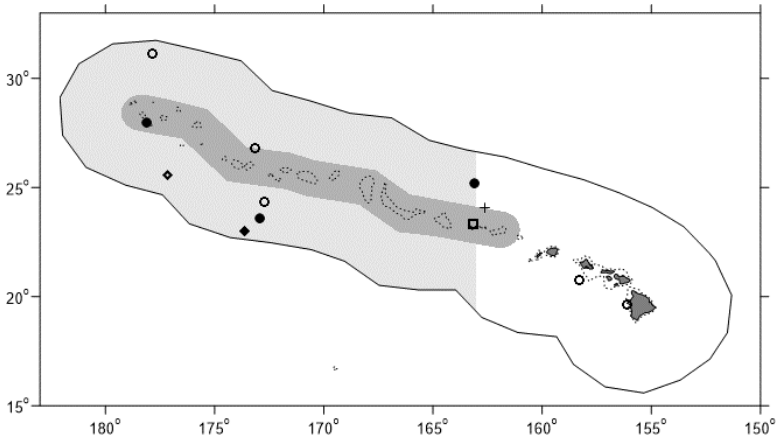

Figure 1. Sighting locations for pygmy sperm whales during 2002 (filled diamond) and 2017 (square) shipboard surveys, as well as sightings of and unidentified *Kogia* during 2002 (open diamond) 2010 (open circle), and 2017 (open square) shipboard cetacean surveys of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006, Bradford *et al*. 2013, Yano *et al*. 2018). A freshly dead pygmy sperm whale was also retrieved during the 2010 survey (cross). Outer line indicates approximate boundary of survey area and U.S. EEZ. Dark gray shading indicates the original Papahanaumokuakea Marine National Monument, with the lighter gray shading denoting the full 2016 Expansion area. Dotted line represents the 1000 m isobath.

For the Marine Mammal Protection Act (MMPA) stock assessment reports, pygmy sperm whales within the Pacific U.S. EEZ are divided into two discrete areas: 1) Hawaiian waters (this report), and 2) waters off California, Oregon and Washington. The Hawaii stock includes animals found both within the Hawaiian Islands EEZ and in adjacent high seas waters; however, because data on abundance, distribution, and human-caused impacts are largely lacking for high seas waters, the status of this stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005).

POPULATION SIZE

Encounter data from shipboard line-transect surveys of the entire Hawaiian Islands EEZ were recently reevaluated for each survey year, resulting in the following abundance estimates of pygmy sperm whales in the Hawaii EEZ (Bradford *et al*. 2021; Table 1). A 2010 shipboard line-transect survey within the Hawaiian EEZ did not result in any sightings of pygmy sperm whales (Bradford *et al*. 2017).

Table 1. Line-transect abundance estimates for pygmy sperm whales derived from surveys of the entire Hawaii EEZ in 2002, 2010, and 2017 (Bradford *et al*. 2021).

Year	Abundance	CV	95% Confidence Limits
2017	42,083	0.64	13,406-132,103
2010	N/A		
2002	12,036	1.04	2,248-64,434

The updated design-based abundance estimates use sighting data from throughout the central Pacific to estimate the detection function and use Beaufort sea-state-specific trackline detection probabilities for pygmy sperm whales from Barlow *et al*. (2015). Although previous estimates from the Hawaii EEZ have been published using subsets of this data, estimates within Bradford *et al*. (2021) use a consistent approach for estimating all abundance

parameters and are considered the best available estimates for each survey year. The best estimate of abundance is from the 2017 survey, or 42,083 (CV=0.64) whales.

Minimum Population Estimate

The minimum population size is calculated as the lower 20th percentile of the log-normal distribution (Barlow *et al*. 1995) around the 2017 abundance estimate, or 25,695 pygmy sperm whales within the Hawaiian Islands EEZ.

Current Population Trend

No data are available on current population abundance or trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size within the U.S EEZ of the Hawaiian Islands (25,695) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with no known fishery mortality or serious injury within the Hawaiian Islands EEZ; Wade and Angliss 1997), resulting in a PBR of 257 pygmy sperm whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. No estimates of human-caused mortality or serious injury are currently available for nearshore hook and line fisheries because these fisheries are not observed or monitored for protected species bycatch.

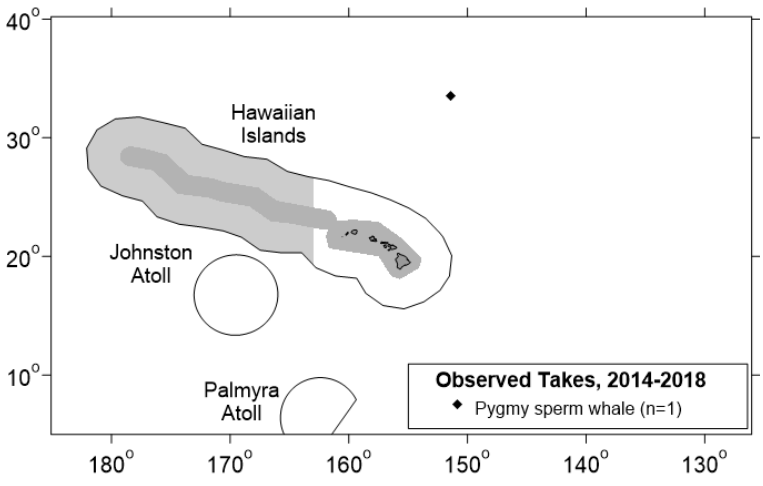

Figure 2. Location of pygmy or dwarf sperm whale takes (filled diamond) in Hawaii-based longline fisheries, 2014-2018. Solid lines represent the U.S. EEZs. Gray shading notes areas closed to commercial fishing, with the PMNM Expansion area closed since August 2016.

There are currently two distinct longline fisheries based in Hawaii: a deep-set longline (DSLL) fishery that targets primarily tunas, and a shallow-set longline fishery (SSLL) that targets swordfish. Both fisheries operate within U.S. waters and on the high seas. Between 2014 and 2018, one pygmy sperm whale was observed hooked in the DSLL fishery (20-22% observer coverage) (Figure 2, Bradford 2018a, 2018b, 2020, Bradford and Forney 2017, McCracken 2019). Based on an evaluation of the observer's description of the interaction and following the most recently developed criteria for assessing serious injury in marine mammals (NMFS 2012), this animal was considered seriously injured (Bradford and Forney 2017). No pygmy sperm whales were observed hooked or entangled in the SSLL fishery (100% observer coverage). There was one additional unidentified cetacean taken in the DSLL fishery during this period that was likely a species of *Kogia,* based on the Observer's description.

Table 2. Summary of available information on incidental mortality and serious injury of pygmy sperm whales (Hawaiian stock) in commercial longline fisheries within and outside of the Hawaiian Islands EEZ (McCracken 2019). Mean annual takes are based on 2014-2018 data unless otherwise indicated. Information on all observed takes (T) and combined mortality events & serious injuries (MSI) is included. Total takes were prorated to deaths, serious injuries, and non-serious injuries based on the observed proportions of each outcome.

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed total interactions (T) and mortality events, and serious injuries (MSI), and total estimated mortality and serious injury (M&SI) of pygmy sperm whales			
				Outside U.S. EEZs		Inside Hawaiian EEZ	
				Obs. T/MSI	Estimated M&SI (CV)	Obs. T/MSI	Estimated M&SI (CV)
Hawaii-based deep-set longline fishery	2014	Observer data	20%	1/1	10 (0.9)	0	0 (-)
	2015		22%	0	0 (-)	0	0 (-)
	2016		21%	0	0 (-)	0	0 (-)
	2017		21%	0	0 (-)	0	0 (-)
	2018		20%	0	0 (-)	0	0 (-)
Mean Estimated Annual Take (CV)					**2.0 (1.2)**		**0 (-)**
Hawaii-based shallow-set longline fishery	2014	Observer data	100%	0	0	0	0
	2015		100%	0	0	0	0
	2016		100%	0	0	0	0
	2017		100%	0	0	0	0
	2018		100%	0	0	0	0
Mean Annual Takes (100% coverage)					**0**		**0**
Minimum total annual takes within U.S. EEZ							**0 (-)**

STATUS OF STOCK

The Hawaii stock of pygmy sperm whales is not considered strategic under the 1994 amendments to the MMPA. The status of pygmy sperm whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Pygmy sperm whales are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor designated as "depleted" under the MMPA. The estimated rate of mortality and serious injury within the Hawaiian Islands EEZ (zero animals per year) is less than the PBR (257). Based on the available data, which indicate total fishery-related takes are less than 10% of PBR, the total fishery mortality and serious injury for pygmy sperm whales can be considered to be insignificant and approaching zero. The increasing level of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for whales (Richardson *et al*. 1995), particularly for deep-diving whales like pygmy sperm whales that feed in the oceans' "sound channel". One pygmy sperm whale found stranded in the main Hawaiian Islands tested positive for *Morbillivirus* (Jacob 2012). Although *Morbillivirus* is known to trigger lethal disease in cetaceans (Van Bressem *et al*. 2009), its impact on the health of the stranded animal is unknown (Jacob 2012). The presence of *Morbillivirus* in 10 species of cetacean in Hawaiian waters (Jacob 2012) raises concerns about the history and prevalence of this disease in Hawaii and the potential population impacts on Hawaiian cetaceans.

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